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AN IMPROVED APPRAISAL SURVEY METHOD FOR BARK BEETLE DAMAGE IN PONDEROSA AND JEFFREY PINE IN THE CALIFORNIA REGION

By

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One of the important functions of the Berkeley Forest Insect Laboratory is to furnish estimates on the number and volume of infested trees in forested areas where control work has been recommended to the land-managing agencies. This has always been a very difficult task and one subject to considerable errors, many of which were not definable so far as sampling procedure was concerned. In an attempt to improve the procedure for making such estimates, a field study was undertaken at the Blacks Mountain Experimental Forest, in the spring of 1951, by Messrs. R. C. Hall, J. W. Bongberg, M.M. Furniss, of the Forest Insect Laboratory, and Dale C. Prentice, of the Western Pine Association, to test the effect of size and shape of plots on efficiency which might be used in appraisal surveys in virgin eastside stands. The most efficient of all those tested proved to be the 1/2-acre circular plot, established at 5 chain intervals, along each compass line. It was possible from this study to determine the theoretical number of plots necessary to sample losses of a comparable nature in any area with a predetermined tolerance in sampling error. Because of its simplicity and expected efficiency, this system was adopted in most of our appraisal surveys for the 1952 season.

The first control project on which the 1/2-acre circular plot method of sampling was used was the Cal-Cone Harvey area on the Lassen National Forest. A reconnaissance survey in late summer had shown that there was an area of about 18,000 acres on the eastern Lassen National Forest where the western pine beetle and the Jeffrey pine beetle were showing epidemic tendencies, and where control action was recommended. The objective in this survey was to obtain estimates of number and volume of infested trees which would be subject to a sampling error of not more than 25% at the 95% confidence level. By substituting the data from the Blacks Mountain study into the formula for the number of plots needed to sample 18,000 acres, it was found that about 900 1/2-acre sample plots, or 450 acres would be needed. This is equivalent to a sample coverage of 2-1/2%.

Field sampling was undertaken during the period September 8-12, 1952, using four one-man crews under the leadership of M. M. Furniss. Plot locations and boundaries were determined by compass and pacing methods. The desired degree of coverage was obtained by running 2 lines through each section at 40-chain intervals, and establishing 1/2-acre circular plots at 5-chain intervals along each line. For convenience, the lines were usually started at predetermined points along roads, and run across the ground contour. All trees on each plot were examined for evidence of bark beetle attack. This was necessary because many infested trees had not faded at the time of the survey, and could only be spotted by the presence of pitch tubes. When infested trees were found, the cause of death and the diameter of the tree were recorded on the plot sheet.

After the field data were collected, it was found necessary to break the estimates down into 2 blocks, since cutting plans for part of the area precluded the need for control. One of these blocks is the Cone-Harvey Mountain area of 11,000 acres where sanitation-salvage logging is planned for 1953, and the other is the Cal Mountain area of 7,000 acres where no sanitation-salvage is possible in the immediate future, under the present cutting schedule. It is important to note that this change in objective influenced the orginal expected sampling error, because the original was based on sampling 18,000 acres, while the latter was based on sampling 11,000 and 7,000 acres separately. An estimate was then made separately for each unit and later combined for the whole area.

The field work was completed on this project on September 12, and the appraisal report finished on September 17, only nine days after the field work was started. The report was sent to the U. S. Forest Service for their consideration. The recommendation was that the Cal Mountain unit should be controlled by the salvage of infested trees with the stipulation that the infested trees be removed from the woods prior to May 1, 1953. The Forest Service acted favorably on this recommendation and immediately started advertisements for bids for a timber sale, which would result in the removal of all the infested trees, together with any abandoned merchantable trees in the Cal Mountain unit. This sale was made to the Susanville Logging Company of Susanville, California on September 30, 1952.

The appraisal was made on the following basis; number of trees and volume of infested 1952-killed trees, number and volume of abandoned 1952-killed trees, number and volume of abandoned 1951-killed trees. The three groups combined, furnished an estimate of the total amount of gross salvable volume. The major consideration in this appraisal was the number and volume of infested trees, because the removal of these trees would be the only control effect. The number and volume of the abandoned, merchantable, salvable trees was incidental and included so that the prospective bidder might have some idea as to the total expected volume available for salvage.

The logging of infested trees was completed early in December, so that it is possible to compare the appraisal estimate with the actual number and volume of insect-killed trees in the area. Table 1 presents data on the estimated number and volume of infested trees, compared with the actual number and volume spotted and shows that these are in very close agreement. The estimated number of infested trees per acre was .1418, compared to .1448 actually spotted, making the estimate 2.17 low. The estimated volume per acre was 166 board feet, compared to 177 board feet per acre spotted, or 6.8% low. These are very satisfactory estimates and although they represent only one example, are sufficiently encouraging to justify further tests of the use of the 1/2-acre circular plots in other appraisal jobs where information is needed on number and volume of infested trees.

The use of the 1/2-acre circular plot system is also quite economical in that the above job cost only about 3 cents per acre for the virgin area treated.

TABLE 1

A COMPARISON OF THE ESTIMATED VOLUME AND NUMBER OF INFESTED AND ABANDONED INSECT-KILLED TREES WITH THAT ACTUALLY SPOTTED ON THE CAL-MOUNTAIN CONTROL AREA

	Estimated	Actual	% Difference
Gross Acres in Control Zone	7,000	7,000	0
Virgin Acres to be Treated	5,000	5,644	12.8% low
Volume of Infested Material Per Acre-Bd.Ft. *	166 ± 55	177	6.8% low
Number of Infested Trees Per Acre	.1418±.0479	.1448	2.1% low
Volume of abandoned Salvable Material Per Acre-Bd.Ft.	202 1/	149 2/	-------
Number Abandoned Trees Per Acre	.152 ± .045	.110	27.6% high

* The appraisal cruise data were increased by 25% to compensate for the time of year of the cruise and to allow for additional expected late fall attacks by the western pine beetle.

1/ Gross volume
2/ Net volume

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